# Share Tenancy, Ownership Structure, and Prevented Planting Claims in Crop Insurance

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ABSTRACT

A theoretical model based on opportunity cost and expected utility principles establishes linkages between the likelihood of prevented planting claims in crop insurance, existing share leasing arrangements and internal farm business structures. Results of probit estimation procedures indicate that simpler internal business structures and a more dominant farmer-tenant leasing position can increase the probability of submitting a prevented planting claim.

*Keywords:* Crop Insurance; Opportunity Costs; Prevented Planting; Share Leasing

**JEL Classification:** G22, Q12, Q18, Q19

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## Introduction

The prevented planting provision is a standard element of crop insurance contracts. This provision allows an insured producer to receive an indemnity payment if he fails to plant an insured crop before a designated planting date, due to a valid cause of loss. The Risk Management Agency (RMA) Compliance Office views prevented planting as a potential source of program vulnerability because producers can receive prevented planting payment without incurring the major costs associated with production of the crop. Payment received due to prevented planting is a positive cash flow to the producer without expending the effort and financial resources to plant, tend, and harvest the crop. Hence, an insured dishonest producer may have incentives to take advantage of this provision and submit a fraudulent prevented planting claim, rather than planting and producing a crop for harvest.

The objective of this study is to determine whether the type of ownership structure significantly affects the likelihood of submitting a prevented planting claim. Two dimensions of ownership structure will be analyzed in this study: the landlord-farmer management relationship under a share leasing arrangement and internal arrangements of farm management under single proprietorship, partnership and corporate business structures. Understanding the relationship between ownership structure and prevented planting can help the RMA formulate strategies to mitigate the abuse of this provision. Ratemaking for additional prevented planting coverage may also be improved with the knowledge about the relationship of ownership structure and prevented planting. Moreover, the RMA can also use the information from this study to profile farmers that are more likely to submit prevented planting claims and investigate them pro-actively to deter potentially fraudulent claims (GAO).

The paper is organized as follows. A theoretical model elucidating the hypothesized effects of opportunity costs, the farmer-tenant's stipulated share in a leasing contract, and ownership structure on the probability of filing a prevented planting claim is developed in the next section. The empirical methods, results, and conclusions are discussed in the remaining three sections.

## Theoretical Framework

This study's basic theoretical framework initially focuses on the influence of different levels of management and risk sharing between the farm owner(s) and landlord(s). These contracts are usually negotiated or renewed by tenants and landlords periodically and, hence, are less permanent arrangements. The conceptual model will subsequently be extended to analyze the effects of various types of internal ownership structures (single versus multiple business owners) on decisions to file prevented planting claims.

### *Farmland Control Options*

Farmland leasing has become an increasingly popular strategy for expanding control of farmland acreage. In 1998, leased farmland comprised 43.8% of farmland acres in the country. This figure is much higher than the average proportion of leased acreage for most of the census years since the turn of the century (Hoppe and Wiebe). Farmland leasing options include the payment of cash rents, sharing of crop income and costs between the farmer and the landlord or hybrid contracts involving combinations of these two options. This study focuses merely on share lease contracts inasmuch as the farmer is able to maintain autonomy in making business decisions under a cash-lease contract.

Relative to farmland ownership, a share lease contract provides farmers with significant incentives that include higher farm returns, business risk reduction and improved liquidity conditions. Empirical evidence suggests that farm operators generally realize higher accounting rates of return under a leasing strategy (Scott; Ellinger and Barry). Owned farmland traditionally generates low current farm returns due its non-depreciability and the accrual of capital gains that are only realized upon liquidation of the asset (Oltmans; Barry and Robison).

Moreover, a share lease contract is a much more risk efficient farmland control option compared to land ownership (Janssen; Barry, *et al.*). The positive correlation between value of harvested crops and the tenant's rental payments to the landowner stabilizes the farmer's net income, thus providing greater risk-reducing benefits to the farmer.

Share leases also provide farmers with liquidity-enhancing opportunities. Under these contracts, the landlord is obligated to disburse his/her contribution of the variable costs whenever such costs are incurred and paid. Surveys and studies in the Midwest (Bullen; Reiss and Koenig) indicate consistent sharing of costs of fertilizer, pesticides, seed and other crop expenses between tenants and landlords. Other contracts allegedly extend cost sharing to expenses for drying, storing and insuring crops. The sharing of these costs offers significant liquidity relief for the farmers who only provide funds to pay for only their share as stipulated in the leasing contract.

These incentives, however, are weighed against a "premium" that a farm operator assigns to the benefit of autonomy enjoyed under full land ownership. The autonomy premium becomes an important consideration in the issue being analyzed in this study where farmers consider the filing of prevented planting claims.

***Share Tenancy and Prevented Planting Claims***

Consider a risk-averse tenant (or producer) and a risk-averse landlord with a share tenancy lease arrangement. Further, assume that both the producer and the landlord bought an Actual Production History (APH) crop insurance contract covering their respective shares of crop output.[1] The APH contract is an individual yield insurance plan that protects producers and landlords against yield shortfalls if their share of actual yield falls below the guaranteed level. APH insurance includes catastrophic coverage (CAT) and optional buy-up levels of coverage above CAT. For a flat fee of $60 per crop per farm, CAT provides a 50 percent yield guarantee and pays an indemnity based on 55 percent of the price election. In this paper, we separate CAT and APH buy-up coverage and hereafter refer to APH buy-up as APH insurance.

APH insurance provides yield protection of up to 85 percent of the producer's or the landlord's share of average historical yield, with a premium based on a chosen yield coverage level. Let $\lambda$ be the tenant's share of the yield and let $(1 - \lambda)$ be the landlord's share of the yield. An APH contract pays an indemnity if the producer's actual yield ($Y_F^a = \lambda Y^a$) or the landlord's actual yield ($Y_L^a = (1-\lambda)Y^a$) falls below the guaranteed yield level ($Y^g$), but offers no price protection.[2] The guaranteed yield for the tenant and the landlord is computed based on the following formula:

(1) $$Y_F^g = \theta_F \lambda Y_F^e$$

(2) $$Y_L^g = \theta_L (1-\lambda) Y_L^e$$

where $\theta$ is the percent yield coverage chosen by the producer or landlord ($\theta$ = 0.50, 0.55, 0.60, 0.65, 0.70, 0.75, 0.80, 0.85) and $Y^e$ is the expected yield based on the average historical yield.[3]

If $Y^a$ at harvest is greater than $Y^g$ for both the producer and landlord, then the insured producer and the landlord do not receive indemnity payments and their payoffs are

[1] Even if only APH crop insurance contract is modeled here, the authors believe that the qualitative results will not be significantly altered under revenue insurance. The empirical portion however will include an insurance type variable that may indicate whether alternative insurance plans have an effect on the likelihood of submitting a prevented planting claim.

[2] Hereinafter, notations with *F* subscripts pertain to the tenant/producer and notations with *L* subscripts pertain to the landlord.

[3] If the producer/landlord has no adequate actual yield history (i.e. 4-year yield history), assigned transitional yields (T-yields) are used to establish the initial 4-year yield history.

$Y_F^a P^m - \eta C^p$ and $Y_L^a P^m - (1-\eta)C^p$, respectively, where $P^m$ is the market price at harvest, $\eta$ is the cost share of the producer, and $C^p$ is the total cost of production through harvest. On the other hand, if $Y_F^a < Y_F^g$ and $Y_L^a < Y_L^g$ at harvest, then both the insured producer and landlord receive an indemnity payment and their payoffs are $(\theta_F \lambda Y_L^e - \lambda Y^a)P_F^g + \lambda Y^a P^m - \eta C^p$ and $[\theta_L (1-\lambda)Y_L^e - (1-\lambda)Y^a]P_L^g + (1-\lambda)Y^a P^m - (1-\eta)C^p$, respectively, where $P^g$ is the guaranteed or elected price. The guaranteed price is a certain fixed proportion of the expected price, which is usually the USDA's projected farm level price for the crop year. This chosen fixed proportion of the expected price ranges from 0.59 to 1.00.

For notational simplicity, let the following expressions hold:

(3) $$\Phi_F^C = \theta_F \lambda Y_F^e P_F^g - \lambda Y^a P_F^g + \lambda Y^a P^m - \eta C^p,$$

(4) $$\Phi_L^C = \theta_L (1-\lambda) Y_L^e P_L^g - (1-\lambda) Y^a P_L^g + (1-\lambda) Y^a P^m - (1-\eta) C^p,$$

(5) $$\Phi_F^D = \lambda Y^a P^m - \eta C^p$$

(6) $$\Phi_L^D = (1-\lambda) Y^a P^m - (1-\eta) C^p.$$

Assuming that the insured producer and the insured landlord have a von Neumann-Morgenstern utility functions with $U' > 0, U'' < 0$, the producer's and the landlord's expected utilities can then be expressed as follows:

(7) $$hU_F(W_F + \Phi_F^C) + (1-h)U_F(W_F + \Phi_F^D)$$

(8) $$hU_L(W_L + \Phi_L^C) + (1-h)U_L(W_L + \Phi_L^D)$$

where *h* is the probability of $Y^a < Y^g$ and *W* is the non-contingent wealth defined as initial wealth less the insurance premium (*p*) paid ($W = W_0 - p$).

Prevented planting provisions are included in standard APH crop insurance contracts. As stated above, the prevented planting provision in the U.S. crop insurance program allows for insured producers to receive an indemnity payment if a producer fails to plant an insured crop before a designated planting date for that crop and county, due to a valid cause of loss. The cause of loss must be general in the surrounding area and must have prevented other producers in the area from planting their crops. Prevented planting payments for the producer and the landlord are based on a guaranteed prevented planting yield computed as follows:

(9) $$Y_F^{gp} = \gamma_F \theta_F \lambda Y_F^E = \gamma_F Y_F^g$$

(10) $$Y_L^{gp} = \gamma_L \theta_L (1-\lambda) Y_L^E = \gamma_L Y_L^g$$

where $\gamma_F$ and $\gamma_L$ are the percent prevented planting guarantee reduction percentage chosen by the producer and landlord ($\gamma_F = \gamma_L$ = 0.60, 0.65, 0.70).[4] Prevented planting guarantee reduction levels at 0.65 and 0.70 are additional buy-up coverage. If an insured producer is prevented from planting and receives a prevented planting payment, his utility can be expressed as $U_F(W_F + \Phi_F^A)$, where $\Phi_F^A = \gamma_F \theta_F \lambda Y_F^e P_F^g - \eta C^{pp}$ and $C^{pp}$ is the production cost incurred by the producer at the point that he was prevented from planting (i.e. fertilizer, herbicide, land rental, tillage cost, other pre-planting costs). Consequently, the landlord's utility will be $U_L(W_L + \Phi_L^A)$, where $\Phi_L^A = \gamma_L \theta_L (1-\lambda) Y_L^e P_L^g - (1-\eta) C^{pp}$.

If the submission of prevented planting claims by the tenant and the landlord are totally independent, then the tenant and the landlord will submit prevented planting claims if and only if the following conditions hold for each of them respectively:

[4] The prevented planting guarantee reductions presented here apply to most crops (i.e. corn, wheat, grain sorghum, soybeans), but some crops have different selection guarantee reduction choices. For example, rice has prevented planting guarantee reductions of 0.45, 0.50, and 0.55, while cotton has prevented planting guarantee reductions of 0.50, 0.55, and 0.60.

(11) $$U_F(W_F + \Phi_F^A) \geq hU_F(W_F + \Phi_F^C) + (1-h)U_F(W_F + \Phi_F^D)$$

(12) $$U_L(W_L + \Phi_L^A) \geq hU_L(W_L + \Phi_L^C) + (1-h)U_L(W_L + \Phi_L^D).$$

However, submitting prevented planting claims by the tenant and the landlord are not usually independent. The tenant has the primary responsibility to decide whether to submit a prevented planting claim or not. If the tenant submits a prevented planting claim, the landlord has no choice but to also submit a prevented planting claim. The tenant is the key decision-maker in this case because he decides whether to submit a claim or not.

The landlord, on the other hand, can agree or disagree with the decision of the tenant, even though he has no choice but to follow the tenant's decision when the tenant decides to submit a prevented planting claim. If the landlord agrees with the tenant, then conditions (11) and (12) hold and both are content. If the landlord disagrees with the tenant submitting a prevented planting claim, the landlord may terminate the relationship with the tenant and the tenant may loose the future income streams from leasing the landlord's land. The tenant's opportunity cost of disagreeing with the landlord can be defined as:

(13) $$\Lambda = \sum_{n=1}^{N} \frac{[(\lambda Y_F^a P^m - \eta C^p))^{LL} - (\lambda Y_F^a P^m - \eta C^p))^{AL}]_n}{(1+r)^n}$$

where $[\lambda Y_F^a P^m - \eta C^p)]^{LL}$ is the potential net revenue from the present landlord's land in year *n*, $[\lambda Y_F^a P^m - \eta C^p)]^{AL}$ is the potential net revenue from an alternative landlord's land in year *n*, *N* is the time horizon, and *r* is the discount rate.

The tenant's expected utility can now be defined as:

(14) $$gU_F(W_F + \Phi_F^A) + (1-g)U_F(W_F + \Phi_F^A - \Lambda)$$

where *g* is the probability that the landlord agrees with the decision to submit a prevented planting claim. Therefore, the tenant will submit a prevented planting claim if and only if:

(15) $gU_F(W_F+\Phi_F^A)+(1-g)U_F(W_F+\Phi_F^A-\Lambda)\geq hU_F(W_F+\Phi_F^C)+(1-h)U_F(W_F+\Phi_F^D)$.

Assume that there exists a landlord agreement probability $\tilde{g}$ that makes the tenant indifferent between submitting a prevented planting claim and endeavoring to grow the crop:

(16) $\tilde{g}U_F(W_F+\Phi_F^A)+(1-\tilde{g})U_F(W_F+\Phi_F^A-\Lambda)=hU_F(W_F+\Phi_F^C)+(1-h)U_F(W_F+\Phi_F^D)$.

This implies that:

(17) $$\tilde{g}=\frac{hU_F(W_F+\Phi_F^C)+(1-h)U_F(W_F+\Phi_F^D)-U_F(W_F+\Phi_F^A-\Lambda)}{U_F(W_F+\Phi_F^A)-U_F(W_F+\Phi_F^A-\Lambda)}.$$

From (17), we can show that the tenant share amount ($\lambda$) has no definitive relationship with $\tilde{g}$ (i.e. $\frac{\partial\tilde{g}}{\partial\lambda}$ > or < 0) and the opportunity cost $\Lambda$ has a positive relationship with $\tilde{g}$ (i.e. $\frac{\partial\tilde{g}}{\partial\Lambda}$ > 0). See Appendix for the proof.

Let $\alpha$ be the probability that the tenant will submit a prevented planting claim. The tenant's problem is to choose $\alpha$ to maximize expected utility

(18) $$V=\alpha[gU_F(W_F+\Phi_F^A)+(1-g)U_F(W_F+\Phi_F^A-\Lambda)]$$
$$+(1-\alpha)[hU_F(W_F+\Phi_F^C)+(1-h)U_F(W_F+\Phi_F^D)].$$

This implies:

(19) $\alpha=0$ if $g<\tilde{g}$,

(20) $\alpha\in[0,1]$ if $g=\tilde{g}$, and

(21) $\alpha=1$ if $g>\tilde{g}$.

Since $\frac{\partial\tilde{g}}{\partial\Lambda}$ > 0, then $\alpha$ is a decreasing function of $\Lambda$. Since the relationship between the tenant share amount ($\lambda$) and $\tilde{g}$ is ambiguous, we must empirically test whether $\alpha$ is an increasing or a decreasing function of $\lambda$.

The theoretical results above can be summed-up in the following propositions:

Proposition 1. *A tenant who has a lower opportunity cost of terminating a relationship with the landlord is more likely to submit a prevented planting claim.*

Proposition 2. *The effect of the tenant's share amount on the likelihood of submitting a prevented planting claim is theoretically ambiguous and must be verified empirically.*

From the tenant's view, if the opportunity costs (i.e. income streams foregone) are less than the potential prevented planting payment, then the tenant is more inclined to file a claim even if the landlord disagrees. Thus, the tenant has more incentives to go ahead and submit a prevented planting claim even regardless whether the landlord disagrees or not. As mentioned above, the effect of tenant share needs to be empirically tested because the theoretical model indicates that tenant shares may either have a negative or a positive relationship with the likelihood of submitting a prevented planting claim.

***Internal Ownership Structures and Prevented Planting Claims***

This analysis is also extended to the internal ownership structures of farm businesses. In several surveys conducted by the USDA during the last few decades, results have consistently shown that 9 out of 10 farms in the country have been organized as single proprietorships. Partnerships have usually accounted for about 5 to 6 percent of the farms. However, recent trends of increasing industrialization accompanied by growth in firm size and increasing complexity of business transactions in the farm sector have shifted considerable attention to the potential growth in the number of non-family corporations among farm businesses.

The choice of the form of business organization can be attributed to preferences for simple business structures, greater control over operations and financial decisions, business continuity, tax implications and access to capital, among others (Dahl; Boehlje and Lins).

Thomas and Boehlje also emphasize the importance of stage of the life cycle for the business and its owner(s) in the choice of business structure.

Partnerships and corporations are typically more complex organizational structures that bring together different stakeholders collectively making operational and management decisions for the farm business. These structures are usually associated with larger farms where business decisions extend beyond the usual production and marketing routines of smaller farm businesses and the complexity of operations requires the technical expertise of other decision-makers.

The single proprietor of a farm business, however, enjoys autonomy and does not need to confer with others in making decisions for the farm business.

Given the varied levels of complexity of the decision-making process under the different business structures, the following propositions relating to decisions on prevented planting claims are formulated:

<u>Proposition 3.</u> *Producers who are single proprietors are more likely to submit a prevented planting claim relative to producers operating under a partnership or corporate structure.*

<u>Proposition 4.</u> *Producers doing business through a partnership are more likely to submit a prevented planting claim relative to producers associated with farm corporations.*

These propositions are more justified within the context of our earlier contention regarding the influence of share tenancy contracts on decisions to file prevented planting claims. The more structured decision-making process in partnership and corporate organizations adds another dimension of complexity in reaching a decision to file a prevented planting claim. The degree to which this is a noticeable constraint would depend upon the number of partners or stockholders. It can, however, be argued that a consensus can be relatively easier to reach among internal owners (i.e. partners and stockholders) rather than between landlords and tenants, although the bureaucratic procedures typically present among more complex organizational structures could slow down the decision-making process and may have limited favor for prevented planting claims.

***Hybrid Arrangements of Internal Ownership and Share Leasing Contracts***

Figure 1 presents possible combinations of internal business ownership and share leasing arrangements. A hierarchical ordering of business scenarios is defined by consolidating the arguments presented in the previous hypotheses on the farmer's tendency to make prevented planting claims under different ownership and share leasing structures.

The hierarchy is basically designed according to the complexity of the decision-making process within the farm business determined simply by the number of people, including both internal owners and landlords[5] that could influence farm business decisions. Consistent with Propositions 3 and 4, simpler decision-making structures are assigned higher placements in the "pyramid" and thus, are expected to demonstrate greater likelihood of filing prevented planting claims than business arrangements assigned lower placements.

In levels 2 and 3 where hybrid arrangements of internal ownership and share leasing arrangements are presented, a left-side placement is assigned a higher probability of filing such claims than business cases found to its right. These expectations are summarized in the following proposition:

<u>Proposition 5</u>: *Producers who operate under simpler internal business structures and simultaneously enter into share leasing agreements are more likely to submit a prevented planting claim relative to producers operating under more structured internal organizations and*

[5] Landlord influence is typically a function of their level of participation, the size of their share, the size of their cropland holdings, and the proportion of the landlord's cropland farmed by the tenant.

*a comparable share leasing contract where the landlord could exert at least the same degree of influence in the farm business decision-making process.*

Specifically, single proprietorships that do not enter into any share-leasing contract occupy the uppermost level of the pyramid. When two decision-makers are involved, a business partnership is more likely to file a claim than a single proprietorship under a share-leasing contract, unless the landlord's share is significantly small enough to diminish his role in farm decision-making.

Under Level 3, there is a greater chance for a closely-held corporate organization without crop share leasing obligations to file such a claim than the other two business cases. With landlord participation in the decision-making process, a multiple-owner farm corporation undergoes the most complicated negotiation process in this hierarchy since it will require consensus of all internal and external business stakeholders to reach a decision to file a prevented planting claim.

## Empirical Methods and Data

A binary choice model is used to empirically test the theoretical predictions above. An insured producer has to make a choice between submitting a prevented planting claim or not. From the theory, an insured producer will submit a prevented planting claim if the expected utility of claiming prevented planting is greater than the expected utility of attempting to grow the crop to harvest. Since the expected utility of submitting a prevented planting claim is unobservable, we model the difference between the expected utility of prevented planting and bringing the crop to harvest as:

$$y_i^* = \boldsymbol{\beta}' \boldsymbol{x}_i + \varepsilon \qquad (24)$$

where $y_i$ * is the unobservable variable. The $\boldsymbol{x_i}$ vector represents the variables that affect likelihood of submitting a prevented planting claim and the $\boldsymbol{\beta'}$ vector is the corresponding parameters. We assume that $\varepsilon$ has a normal distribution with mean 0 and variance 1.

We do not observe expected utility but we do observe whether a prevented planting claim has been submitted or not. Thus, a binary variable can be defined as:

(25) $$y = 1 \qquad \text{if } y_i * > 0$$

(26) $$y = 0 \qquad \text{otherwise.}$$

In our case, $y$ = 1 if a prevented planting claim has been submitted and $y$ = 0 otherwise. It follows that:

(27) $$\text{Prob}\ (y = 1) = \text{Prob}\ (\varepsilon > -\boldsymbol{\beta'}\boldsymbol{x}_i) = F(\boldsymbol{\beta'}\boldsymbol{x}_i)$$

where $F$ is the cumulative distribution function of $\varepsilon$ (Greene). Since we assumed a normal distribution for $\varepsilon$, the probit form of the model is estimated here. The probit distribution is given by

(28) $$\text{Prob}(y = 1) = \int_{-\infty}^{\boldsymbol{\beta'}\boldsymbol{x}_i} \varphi(t)dt$$

where $\varphi$ represent the standard normal distribution. A maximum likelihood procedure is used to estimate the parameters of the binary choice models above. Because the estimated coefficients arising from these regressions are not marginal effects, additional calculations are necessary. Following Greene, the marginal effects for the probit model is given by:

(16) $$\frac{\partial E[y \mid \boldsymbol{x}_i]}{\partial \boldsymbol{x}_i} = \varphi(\boldsymbol{\beta'}\boldsymbol{x}_i)\boldsymbol{\beta}\ .$$

Note that the marginal effects in this study are computed at the means of $\boldsymbol{x}_i$.

In this study, only RMA data of insured producers for reinsurance year (RY) 2001 are considered and Catastrophic (CAT) insurance policies are excluded from the analysis. Only crop insurance data under the RMA's southern regional compliance office (RCO) for corn, cotton, oats, onions, peanuts, rice, soybeans, and wheat are considered. Producers who bought a valid insurance policy are included in the data, regardless of whether they submitted a prevented planting claim or not. The data are aggregated at the crop policy level for a particular crop, type and practice. This results in 190,079 valid observations.

The dependent variable in this study is a binary variable (PPC) where PPC = 1 if a prevented planting claim was submitted and PPC = 0 otherwise. The elements of vector $\boldsymbol{x}_i$ representing the independent variables of the model are listed in Table 1. Four estimating equations are considered in this study: a general model that considers all farm observations and three other versions of the original model applied to subsets of farms classified according to the type of business organization (i.e. single proprietorship, partnership and corporate farms).

To empirically verify proposition 1, a variable representing expected crop revenues (REVENUE) is used as proxy for opportunity cost. This variable is derived using annualized crop prices from the USDA's Agricultural Outlook publication and expected yield information from the RMA database that is based on a 4-10 year yield history that captures the potential productivity of the landlord's land. Based on the arguments supporting proposition 1, we would expect the sign of REVENUE to be negative. Proposition 2 is empirically tested by examining the sign related to the SHARE variable (i.e. the farmer-tenant's share in the leasing contract), in all four models. From the theory, there is no *a priori* expectation for the sign of this variable. Propositions 3 and 4 are verified by examining the sign and the magnitude of the dummy variables for the type of business organization (SINGLE and PARTNER) in the all farms model.

The signs of SINGLE and PARTNER are expected to be positive. Proposition 5 is verified by comparing the signs and magnitudes of the SHARE variable in the three versions of the model developed for the types of business organizations.

There are no *a priori* expectations for the rest of the dummy variables included in the model (i.e. geographical dummy variables, etc.). Summary Statistics and frequencies of the dummy variables are in Table 2. A planted acres variable (ACRES) was also included in the model to allow for scale effects.

## Results and Discussion

Estimation results of the probit model, together with the estimated marginal effects, are presented in Table 3. The likelihood ratio (LR) test indicates that the coefficient vector is not zero because the LR chi-square statistic with 21 degrees of freedom is significant at the 1% level. However, the reported goodness-of-fit measures (i.e. pseudo $R^2$ and the McKelvey and Zavoina $R^2$) indicate that the regression line only fits moderately well.

As expected, the variable that proxies for the opportunity cost of terminating the landlord-tenant relationship (REVENUE) has a statistically significant negative effect on the probability of submitting a prevented planting claim in the all farms model as well as in the three (3) farm business models. However, in all four instances, the magnitude of the marginal effect of REVENUE on the likelihood of submitting a prevented planting claim is small. A unit increase in REVENUE decreases the probability of submitting a prevented planting claim by 0.000001. The negative sign of the REVENUE coefficient verifies our theory that lower opportunity costs increases the likelihood of submitting a prevented planting claim (and vice-versa). Though the magnitude of this effect may be very small, the results establish it as one of the significant determinants of the farmer's tendency to file a prevented planting claim.

The estimated coefficient related to the farmer tenant's share in the leasing contract (SHARE) has a statistically significant positive sign in all four models. This suggests that the likelihood of submitting a prevented planting claim increases as the tenant share increases. Under the three different business type models, the marginal effect of the SHARE variable is larger for single proprietorship farms (0.03210) than corporate (0.01760) and partnership (0.01544) farms. This verifies our contention that less structured business organizations with smaller number of business decision-makers would experience less constraints in making decisions to submit prevented planting claims. Thus, as the hierarchy in Figure 1 suggests, simpler forms of business organization such as single proprietorship farms with substantial share in leasing contracts have greater flexibility in making prevented planting claims than farm business cases with more complicated business structures presented in the lower levels of the hierarchy.

The business type dummy variables (SINGLE and PARTNER) in the all farms model both have significant positive effects on the dependent variable. This therefore suggests that farms belonging to both business types have greater tendencies to submit prevented planting claims than corporate farms. Between the two results, SINGLE has a larger marginal effect (0.00606) than PARTNER (0.00403), thus, confirming the expectation that, between these two types of farms, sole proprietorship farms enjoy a much greater edge over corporate farms in terms of less structural constraints in making business decisions.

The size variable, ACRES, also has a significant negative effect on the dependent variable in all four models. This supports the notion that larger-scale operations involve higher fixed costs, which then reduces the attractiveness of submitting a prevented planting claim as compared to carrying the crop to harvest. Notably, ACRES has a larger marginal effect among single proprietorship farms than the other two business types. Perhaps, this suggests that, among such farms, larger farm size not only could translate to higher opportunity costs but also could have resulted from greater reliance on leasing arrangements to expand control of farmland acreage (thus accommodating higher landlord shares in leasing arrangements). Both of these factors have been earlier associated with lower probabilities of filing prevented planting claims.

The coefficients related to insurance plans (CRC and APH), states, and crops also deserve some discussion here. Results from the four models indicate that producers who purchased APH contracts are less likely to submit a prevented planting claim relative to other producers who bought other insurance plans. The insurance plan dummy variable for the CRC option was only significant in the partnership farm model. These results suggest that there may be some merit in exploring differential prevented planting buy-up rates for APH and non-APH plans since producers with APH plans are less likely to submit a prevented planting claim.

The coefficients and marginal effects of the crop dummy variables indicate that there are several significant crop-specific effects. In the all farms model, producers of cotton, oats, onions, and peanuts are less likely to submit a prevented planting claim relative to producers of corn, while producers of rice, soybeans, and wheat are more likely to submit a prevented planting claim relative to producers of corn. In the three business type models, the coefficient signs of these crop dummy variables consistently indicate the same trend; however, certain crop dummies lose their significance in one or two models.

The coefficients and marginal effects of the state dummy variables also suggest that there are significant geographical effects. In the all farms model, producers in Louisiana, New Mexico, Oklahoma and Texas tend to have a higher probability of submitting an anomalous prevented planting claim, relative to the excluded state (Arkansas). Producers in Kentucky, Mississippi and

Tennessee tend to have a lower probability of submitting a potentially fraudulent prevented planting claim, relative to the excluded state (Arkansas). Among these, the dummy variables for Louisiana, Mississippi, Oklahoma and Texas consistently had similar and significant effects in all the three business type models. The other state variables were also able to retain similar coefficient signs but had insignificant explanatory power in one of the three other models.

## Conclusions

The results of this study suggest that a farmer's decision to submit a prevented planting claim in crop insurance is not only governed by opportunity cost principles, but can also be influenced by the magnitude of the farmer's stipulated share in a leasing contract and the type of internal organizational set-up of the farm business. Specifically, more dominant shares for the farmer-tenant under a leasing arrangement increase the likelihood of submitting a prevented planting claim. Moreover, sole proprietorship farms exhibit a greater tendency to make the same decisions than farms operating under either partnership or corporate structures. Sole proprietor situations are characterized by less complex organizational structures that provide farmers with greater autonomy and flexibility in making decisions without having to reach a consensus with a larger group of stakeholders that could have differing opinions and influence.

When hybrid arrangements of share tenancy and internal business organizations are considered, this study provides evidence that the smaller the collective number of both internal (farm owners) and external (landlords) decision-makers, the greater the likelihood for the farm to submit prevented planting claims.

Share-tenancy arrangements appear to be an institutional "self-policing" mechanism that reduces the probability of submitting prevented planting claims. This, in turn, can reduce the probability to abuse the prevented planting provision. Given this result, RMA can reformulate their ratemaking procedures for additional prevented planting buy-up coverage by considering the self-policing effect of share-tenancy arrangements. Perhaps the RMA can consider giving prevented planting buy-up discounts for share tenants with lower shares. In addition, the empirical results with regards to the claim behavior of producers with non-APH plans (versus producers with APH plans) suggest that a differential prevented planting buy-up rate for different insurance plans may deserve further exploration and analysis.

Ownership structure and share-leasing arrangements can also be used by the RMA compliance office as an additional variable to profile producers that are most likely to abuse prevented planting provisions. In conjunction with other “fraud” indicator variables, RMA may be able to better prioritize individuals worthy of further investigation or worthy of in-season checks for abuse or fraud (USDA OIG).

## References


Barry, P. J. and L. J. Robison. “Economic Versus Accounting Rates of Return for Farm Land.” *Land Economics,* 62 (November 1986):388-401.

Barry, P. J., L. M. Moss, N. L. Sotomayor and C. L. Escalante. “Lease Pricing for Farm Real Estate.” *Review of Agricultural Economics*, 22 (Spring/Summer 2000): 2-16.

Boehlje, M. D. and D. Lins. “Alternative Financial/Organizational Structures of Farm and Agribusiness Firms.” Cooperative Extension Service, Purdue University, NCR-568, April 1995.

Bullen, G. *Farmers' Leasing Practices in Illinois.* Cooperative Extension Service, University of Illinois, 1999.

Dahl, D. C. “A New Look at Farm Business Organization.” *Minnesota Agricultural Economist,* Agricultural Extension Service, Univ. of Minnesota, No. 681 (Summer 1995); pp.1-4.

Ellinger, P. N. and P. J. Barry. "The Effects of Tenure Position on Farm Profitability and Solvency: An Application to Illinois Farms." *Agricultural Finance Review,* 47(1987): 106-18.

Greene, W. *Econometric Analysis.* Fourth Edition, Prentice Hall: Upper Saddle River, NJ, 2000.

Hoppe, R. and K. Wiebe. “Land Ownership and Farm Structure.” In *Agricultural Resources and Environmental Indicators, 2000.* Resources Division, Economic Research Service, U. S. Department of Agriculture, September 2000.

Janssen, L. “Empirical Analysis of Tenure Patterns and Farm Structure,” in *Size, Structure, and the Changing Face of American Agriculture,* A. Hallam, *ed.*, Boulder, CO: Westview Press, 1993.

Johnson, J. and Perry, J. E. “Business Organization and Arrangements of Farms.” in *Structures and Financial Characteristics of U. S. Farms: 2001 U. S. Family Farm Report*. R. A. Hoppe, *ed.* Resource Economics Division, Economic Research Service, U. S. Department of Agriculture, Agriculture Information Bulletin No. 768, May 2001.

Oltmans, Arnold W., "Why Farmland Cannot, Will Not and Should Not Pay for Itself," *The Journal of American Society of Farm Managers and Rural Appraisers*. (1995): 57-67.

Reiss, F. J. and C. J. Koenig. “Farm Leasing Practices in South-Eastern Counties.” Department of Agricultural Economics, University of Illinois, July 1980.

Scott, J. T., Jr. "Changes in Capital and Income Relationships." *N. C. Journal of Agricultural Economics.* 5(July 1983):27-37.

Thomas, K. H. and M. D. Boehlje. "Farm Business Arrangements: Which One for You?" North Central Region Education Materials Project, Iowa State University, NCR Extension Publication No. 50, 1991.

U.S. Department of Agriculture Office of the Inspector General (USDA OIG). *Risk Management Agency Prevented Plantings of 1996 Insured Crops.* Audit Report No. 05601-5-Te, USDA OIG: Washington, D.C. March 1999.

U.S. General Accounting Office (GAO). *Crop Insurance: USDA Needs a Better Estimate of Improper Payments to Strengthen Controls Over Claims.* GAO/RCED 99-266, U.S. GAO: Washington, D.C. September 1999.

Table 1. Independent variables used in the empirical model and its description.

| Variable Name | Variable Definition |
|---|---|
| REVENUE | Expected crop revenues based on annualized crop prices and yield based on a 4-10 year yield history (or T-yields if history is not adequate) |
| SHARE | Farmer tenant's percentage share under a share leasing contract |
| SINGLE | Dummy variable indicating single proprietorship type of business. SINGLE = 1 if full ownership, SINGLE = 0 otherwise. |
| PARTNER | Dummy variable indicating partnership type of business. PARTNER = 1 if partnership, PARTNER = 0 otherwise. |
| CORP | Dummy variable indicating corporate type of business. CORP = 1 if partnership, CORP = 0 otherwise. CORP is the excluded business classification variable in the estimating equation. |
| ACRES | Producers' planted acres |
| CRC | Dummy variable representing the Crop Revenue Coverage (CRC) insurance plan. CRC = 1 if the insurance plan is CRC, CRC = 0 otherwise. |
| APH | Dummy variable representing the standard APH (or MPCI) yield insurance plan. APH = 1 if the insurance plan is APH, APH = 0 otherwise. |
| KY, LA, MS, NM, OK, TN, TX, AK | Geographical state dummy variables. The states in the southern RCO are Kentucky (KY), Louisiana (LA), Mississippi (MS), New Mexico (NM), Oklahoma (OK), Tennessee (TN), Texas (TX), and Arkansas (AK). Arkansas is the excluded category. |
| COT, OAT, ONI, PNT, RCE, SOY, WHT, CRN | Dummy variable representing the crop planted. The crops are: cotton (COT), oats (OAT), onions (ONI), peanuts (PNT), rice (RCE), soybeans (SOY), wheat (WHT) and corn (CRN). Corn is the excluded category. |

Table 2. Summary statistics of continuous variables and frequency of dummy variables.

| (a) Continuous Variables | Mean | Standard Deviation | Min. | Max. | No. of Obs. |
|---|---|---|---|---|---|
| SHARE (%) | 59.35 | 34.18 | 0.10 | 100.00 | 190,079 |
| REVENUE ($) | 5,623.97 | 8,975.44 | 2.80 | 51,319.75 | 190,079 |
| ACRES | 178.09 | 307.90 | 0.02 | 17,041 | 190,079 |

| (b) Dummy Variables | Frequency | Percent | (b) Dummy Variables | Frequency | Percent |
|---|---|---|---|---|---|
| PPC | 7,914 | 4.16 | TN | 8,130 | 4.28 |
| SINGLE | 149,270 | 78.53 | TX | 98,393 | 51.76 |
| PARTNER | 21,256 | 11.18 | AK | 25,184 | 13.25 |
| CORP | 19,553 | 10.29 | COT | 52,506 | 27.62 |
| CRC | 46,007 | 24.20 | OAT | 785 | 0.41 |
| APH | 136,354 | 71.74 | ONI | 283 | 0.15 |
| KY | 9,159 | 4.82 | PNT | 4,133 | 2.17 |
| LA | 11,142 | 5.86 | RCE | 8,935 | 4.70 |
| MS | 9,523 | 5.01 | SOY | 27,919 | 14.69 |
| NM | 2,002 | 1.05 | WHT | 45,936 | 24.17 |
| OK | 26,546 | 13.97 | CRN | 49,582 | 26.09 |

Table 3. Estimation results of the probit model for all farms and subsets of single proprietorship, partnership and corporate farms

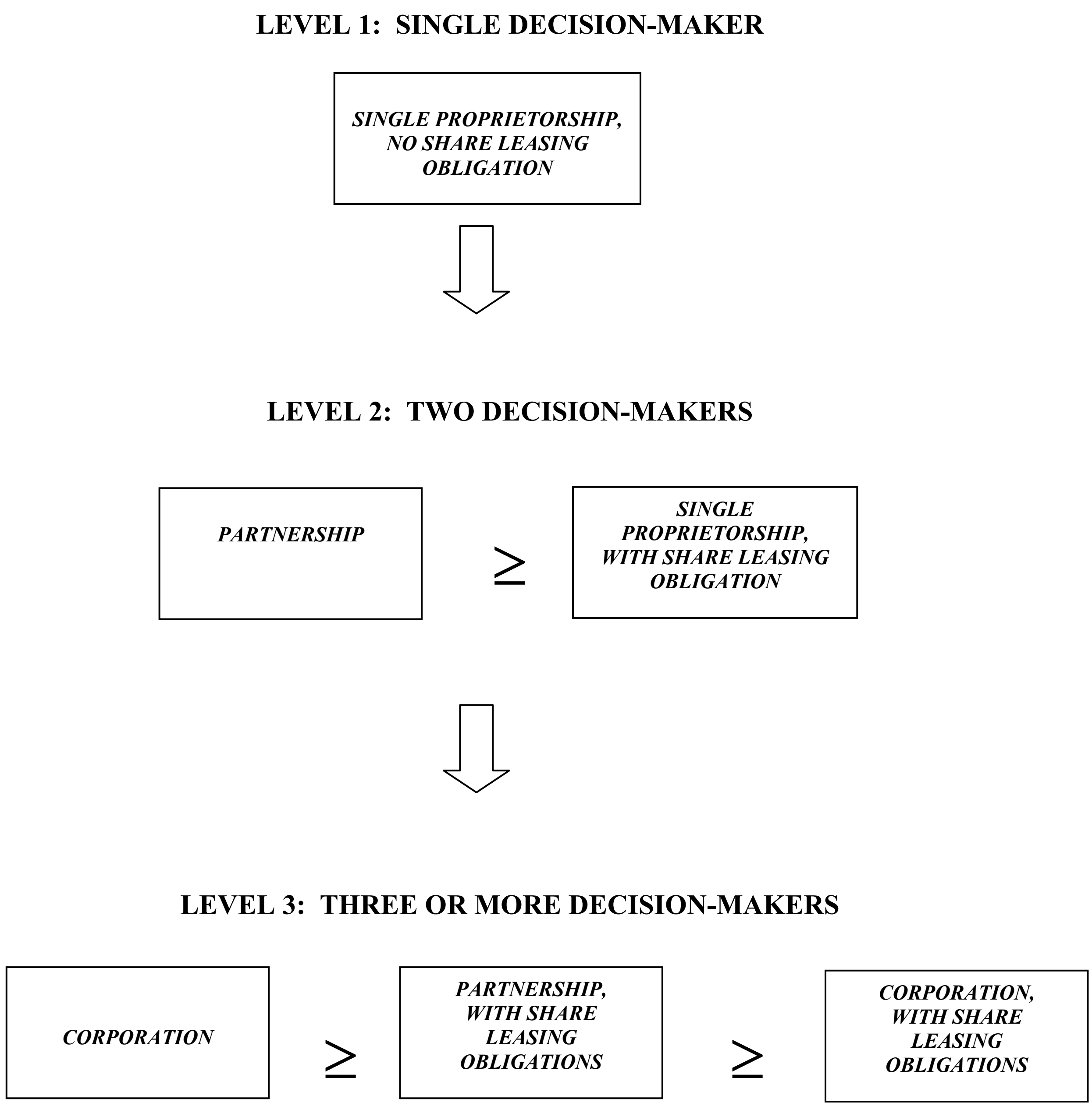
| Variable | All Farms | | Single Proprietorship Farms | | Partnership Farms | | Corporate Farms | |
|---|---|---|---|---|---|---|---|---|
| | Coefficient Estimate | Marginal Effect | Coefficient Estimate | Marginal Effect | Coefficient Estimate | Marginal Effect | Coefficient Estimate | Marginal Effect |
| | | | ---- (standard errors in parentheses)---- | | | | | |
| INTERCEPT | -2.62775* | | -2.56980* | | -2.09165* | | -2.64721* | |
| | (0.05511) | | (0.06085) | | (0.17438) | | (0.20405) | |
| REVENUE | -0.00002* | -0.00000* | -0.00002* | -0.00000* | -0.00002** | -0.00000** | -0.00001*** | -0.00000*** |
| | (0.00000) | (0.00000) | (0.00000) | (0.00000) | (0.00001) | (0.00000) | (0.00001) | (0.00000) |
| SHARE | 0.67390* | 0.02745* | 0.69883* | 0.03210* | 0.67468* | 0.01544* | 0.58081* | 0.01760* |
| | (0.01918) | (0.00092) | (0.02070) | (0.00113) | (0.07538) | (0.00213) | (0.07878) | (0.00256) |
| ACRES | -0.00091* | -0.00004* | -0.00103* | -0.00005* | -0.00080* | -0.00002* | -0.00047* | -0.00001* |
| | (0.00003) | (0.00000) | (0.00004) | (0.00000) | (0.00009) | (0.00000) | (0.00008) | (0.00000) |
| SINGLE | 0.16389* | 0.00606* | | | | | | |
| | (0.02227) | (0.00076) | | | | | | |
| PARTNER | 0.09172* | 0.00403* | | | | | | |
| | (0.02918) | (0.00138) | | | | | | |
| CRC | -0.02659 | -0.00107 | -0.00488 | -0.00022 | -0.45328* | -0.00811* | -0.03531 | -0.00105 |
| | (0.03732) | (0.00148) | (0.03945) | (0.00180) | (0.15365) | (0.00229) | (0.18145) | (0.00527) |
| APH | -0.37111* | -0.01823* | -0.34787* | -0.01886* | -0.82400* | -0.03318* | -0.38129** | -0.01462** |
| | (0.03721) | (0.00221) | (0.03930) | (0.00253) | (0.15419) | (0.01013) | (0.18200) | (0.00873) |
| KY | -0.64188* | -0.01463* | -0.58557* | -0.01604* | -0.72472* | -0.00797* | -0.37482 | -0.00772 |
| | (0.08231) | (0.00090) | (0.09519) | (0.00135) | (0.27461) | (0.00132) | (0.25547) | (0.00332) |
| LA | 0.72318* | 0.05810* | 0.75532* | 0.06935* | 0.68300* | 0.03162* | 0.87325* | 0.06102* |
| | (0.03911) | (0.00508) | (0.05177) | (0.00768) | (0.08704) | (0.00690) | (0.09040) | (0.01090) |
| MS | -0.64239* | -0.01468* | -0.66246* | -0.01655* | -0.73440* | -0.00985* | -0.47922** | -0.00952** |
| | (0.10919) | (0.00111) | (0.15930) | (0.00168) | (0.20900) | (0.00140) | (0.22378) | (0.00256) |
| NM | 0.63913* | 0.05026* | 0.72797* | 0.068723* | 0.33830 | 0.01158 | 0.68991* | 0.04423* |
| | (0.06643) | (0.00842) | (0.07993) | (0.01247) | (0.25567) | (0.01226) | (0.15666) | (0.01701) |
| OK | 0.91117* | 0.07634* | 0.99824* | 0.09440* | 0.79759* | 0.04412* | 0.98923* | 0.07906* |
| | (0.03589) | (0.00493) | (0.04686) | (0.00720) | (0.10089) | (0.01029) | (0.09768) | (0.01416) |
| TN | -0.33742* | -0.01000* | -0.30271* | -0.01050* | -0.29444 | -0.00496 | 0.08225 | 0.00273 |
| | (0.07482) | (0.00152) | (0.08962) | (0.00225) | (0.19259) | (0.00230) | (0.22887) | (0.00827) |
| TX | 1.03620* | 0.04712* | 1.13940* | 0.05593* | 0.93281* | 0.03149* | 0.87978* | 0.03345* |
| | (0.03465) | (0.00194) | (0.04612) | (0.00268) | (0.07708) | (0.00411) | (0.08603) | (0.00420) |
| COT | -0.49652* | -0.01651* | -0.50137* | -0.01889* | -0.25751*** | -0.00516*** | -0.43758* | -0.01099* |
| | (0.04310) | (0.00129) | (0.04853) | (0.00164) | (0.13790) | (0.00255) | (0.14935) | (0.00332) |
| OAT | -0.15326** | -0.00531** | -0.18939* | -0.00717* | -0.18415 | -0.00340 | 0.25105 | 0.01012 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (0.07004) | (0.00204) | (0.07480) | (0.00230) | (0.27969) | (0.00408) | (0.29401) | (0.01524) |
| ONI | -0.27921$^{*}$ | -0.00848$^{*}$ | -0.22055 | -0.00807 | -1.00600$^{*}$ | -0.00814$^{*}$ | 0.11682 | 0.00404 |
| | (0.10875) | (0.00236) | (0.15178) | (0.00431) | (0.28584) | (0.00100) | (0.25987) | (0.01019) |
| PNT | -2.01250$^{*}$ | -0.01818$^{*}$ | -1.98126$^{*}$ | -0.02102$^{*}$ | | | | |
| | (0.15530) | (0.00048) | (0.15770) | (0.00058) | | | | |
| RCE | 0.39309$^{*}$ | 0.02348$^{*}$ | 0.41326$^{*}$ | 0.02829$^{*}$ | 0.41723$^{***}$ | 0.01453$^{***}$ | 0.50042$^{**}$ | 0.02444$^{**}$ |
| | (0.07664) | (0.00623) | (0.09100) | (0.00858) | (0.21947) | (0.01069) | (0.20901) | (0.01480) |
| SOY | 0.09247$^{*}$ | 0.00404$^{*}$ | 0.03942 | 0.00187 | 0.29304$^{*}$ | 0.00833$^{*}$ | 0.29429$^{*}$ | 0.01113$^{*}$ |
| | (0.02560) | (0.00120) | (0.02960) | (0.00144) | (0.07228) | (0.00253) | (0.07748) | (0.00357) |
| WHT | 0.05090$^{*}$ | 0.00213$^{*}$ | 0.04913$^{*}$ | 0.00231$^{*}$ | 0.03669 | 0.00086 | 0.08751$^{***}$ | 0.00282$^{***}$ |
| | (0.01409) | (0.00061) | (0.01532) | (0.00074) | (0.05073) | (0.00123) | (0.05277) | (0.00182) |
| Observations | 190,079 | | 149,270 | | 20,988 | | 19,205 | |
| Log Likelihood | -27,651.60 | | -23,289.59 | | -2,227.92 | | -2,043.06 | |
| LR chi square | 10,504.78$^{*}$ | | 8,769.12$^{*}$ | | 914.79$^{*}$ | | 664.44$^{*}$ | |
| McKelvery & Zavoina's $R^2$ | 0.385 | | 0.372 | | 0.428 | | 0.314 | |
| Pseudo $R^2$ | 0.1596 | | 0.1584 | | 0.1703 | | 0.1399 | |

Notes: (1) Asterisks denote significance at the 1% (*), 5% (**) and 10% (***) confidence levels;

(2) The variable PNT was dropped from the partnership and corporate farm equations due to its poor predictive power. As a result, some observations were automatically discarded by the statistical program.

**Figure 1.** Hierarchy of Ownership Structures and Share Leasing Arrangements



## Appendix

In this Appendix, we show that $\frac{\partial \tilde{g}}{\partial \Lambda} > 0$ and $\frac{\partial \tilde{g}}{\partial \lambda}$ < or > 0. To reduce notational clutter, assume that:

(A1) $\Psi^N = hU_F(W_F + \Phi_F^C) + (1-h)U_F(W_F + \Phi_F^D) - U_F(W_F + \Phi_F^A - \Lambda)$ and

(A2) $$\Psi^D = U_F(W_F + \Phi_F^A) - U_F(W_F + \Phi_F^A - \Lambda) .$$

This implies that:

(A3) $$\tilde{g} = \frac{\Psi^N}{\Psi^D} .$$

Note that ($0 < \tilde{g} < 1$), $\Psi^N > 0$, and $\Psi^D > 0$.

The first derivative of $\tilde{g}$ with respect to $\Lambda$ is

(A4) $$\frac{\partial \tilde{g}}{\partial \Lambda} = \frac{[U_F'(W_F + \Phi_F^A)][\Psi^D] - [U_F'(W_F + \Phi_F^A - \Lambda)][\Psi^N]}{\Psi^{D^2}} > 0 .$$

Since $0 < \tilde{g} < 1$, then we know that $\Psi^D > \Psi^N$. Moreover, $U_F'(W_F + \Phi_F^A) > U_F'(W_F + \Phi_F^A - \Lambda)$ because $U_F' > 0$ and $W_F + \Phi_F^A > W_F + \Phi_F^A - \Lambda$. Given these conditions, the numerator of (A4) is positive and therefore (A4) is positive.

The first derivative of $\tilde{g}$ with respect to $\lambda$ is

(A5) $$\frac{\partial \tilde{g}}{\partial \lambda} = \frac{[\Omega^1 + \Omega^2 - \Omega^3][\Psi^D] - [\Omega^4][\Psi^N]}{\Psi^{D^2}} > \text{or} < 0,$$

where:

(A6) $$\Omega^1 = [hU_F'(W_F + \Phi_F^C)][\theta_F Y_F^e P_F^g - Y^a P_F^g + Y^a P^m] ,$$

(A7) $$\Omega^2 = [(1-h)U_F'(W_F + \Phi_F^D)][Y^a P^m] ,$$

(A8) $$\Omega^3 = [U_F'(W_F + \Phi_F^A - \Lambda)][\gamma_F \theta_F Y_F^e P_F^g] \text{, and}$$

(A9) $$\Omega^4 = [U_F^{'}(W_F + \Phi_F^A)][\gamma_F \theta_F Y_F^e P_F^g] - [U_F^{'}(W_F + \Phi_F^A - \Lambda)][\gamma_F \theta_F Y_F^e P_F^g].$$

If $[\Omega^1 + \Omega^2 - \Omega^3] > 0$ and $[\Omega^1 + \Omega^2 - \Omega^3] > \Omega^4$, then (A5) is greater than zero. On the other hand, if $[\Omega^1 + \Omega^2 - \Omega^3] < 0$, then (A5) is less than zero.